Spot Safety Project Evaluation

Project Log # 200704331

Spot Safety Project # 12-98-009

Spot Safety Project Evaluation of the Traffic Signal Installation
At the Intersection of SR 1474 (27th St. Dr. SE) and
SR 1468 (Sweet Water Rd / 21st St. Dr. SE)
City of Hickory, Catawba County

Documents Prepared By:

Safety Evaluation Group
Traffic Safety Systems Management Section
Traffic Engineering and Safety Systems Branch
North Carolina Department of Transportation

Principal Investigator

_____ 11-5-2007
Jason B. Schronce Date

Traffic Safety Project Engineer

Spot Safety Project Evaluation Documentation

Subject Location

Evaluation of Spot Safety Project Number 12-98-009 – The Intersection of SR 1474 (27th Street Drive SE) and SR 1468 (Sweet Water Road / 21st Street Drive SE) in the City of Hickory, Catawba County.

Project Information and Background from the Project File Folder

The spot safety project improvement countermeasure chosen for the subject location was the installation of a 2-phase, actuated traffic signal. SR 1474 and SR 1468 are both two-lane facilities at the subject intersection with no turn lanes and speed limits of 45 mph. The subject location is a three-leg intersection, which was controlled by a stop sign on SR 1474 (27th Street Drive SE).

The original statement of problem was that there was excessive delay on SR 1474. The intersection met MUTCD signal warrants 2, 9, and 11.

The initial crash analysis was completed from June 1, 1995 to May 31, 1998 with four (4) Angle Crashes at the intersection. The final completion date for the improvement at the subject intersection was on May 30, 2002 with a total cost of $30,000.00.

Naive Before and After Analysis

After reviewing the spot safety project file folder along with all the crashes at the subject location, the crash data omitted from this analysis to consider for an adequate construction period was from March 1, 2002 to August 30, 2002. The before period consisted of reported crashes from October 1, 1997 through February 28, 2002 (4 years and 5 months) and the after period consisted of reported crashes from September 1, 2002 through January 31, 2007 (4 years and 5 months). The ending date for this analysis was determined by the date of available crash data at the time of analysis.

The treatment data consisted of all crashes within 150 feet of the subject intersection. *Please see attached location map and photos for further details.*

The following data table depicts the Naive Before and After Analysis for the treatment location. Please note that Frontal Impact and Ran-Off Roadway (Straight) Crashes were the target crashes for the applied countermeasure. The Frontal Impact Crash types considered are as follows: Left turn, same roadway; Left turn, different roadways; Right turn, same roadway; Right turn, different roadways; Head on; and Angle. Being a tee intersection, ran-off roadway straight crashes indicated that the driver failed to stop for the stop sign therefore further creating a frontal impact collision hazard.

Treatment Information			
	Before	**After**	**Percent Reduction (-) Percent Increase (+)**
Total crashes	17	7	- 58.82 %
Total Severity Index	3.61	5.23	44.88 %
Target Crashes	13	4	- 69.23 %
Target Crash Severity Index	3.85	4.70	22.08 %
Volume	15,110	13,300	- 11.98 %
Injury Crash Summary			
Fatal injury Crashes	0	0	N/A
Class A injury Crashes	0	0	N/A
Class B injury Crashes	1	1	0.00 %
Class C Injury Crashes	5	3	- 40.00 %
Total Injury Crashes	6	4	- 33.33 %

The naive before and after analysis at the treatment location resulted in a 59 percent decrease in Total Crashes, a 69 percent decrease in Target Crashes, and a 45 percent increase in the Total Severity Index. The before period ADT year was 1999 and the after period ADT year was 2004.

Results and Discussion

The naive before and after analysis involving the comparison of treatment actual before data versus treatment actual after data resulted in a 59 percent decrease in Total Crashes and a 69 percent decrease in Target Crashes. The summary results above demonstrate that both Total Crashes and Target Crashes appear to have decreased at the treatment location from the before to the after period.

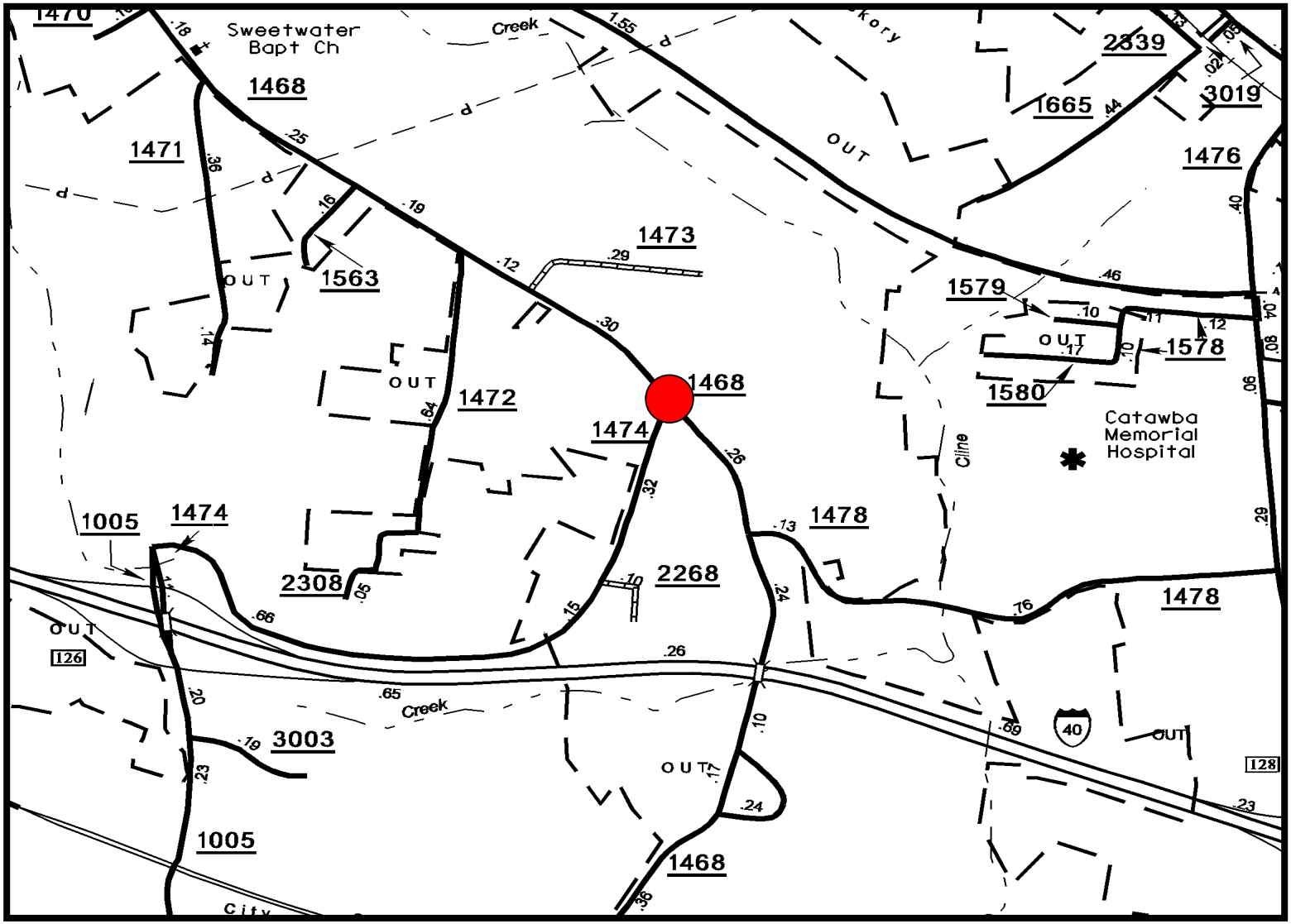
Referencing the *Collision Diagram*, a large portion of crashes at the intersection in the before period (7 of 17) were the result of a vehicle failing to stop for the stop sign on SR 1474 and running off the roadway through the intersection. After the signal installation, this pattern was significantly reduced to just one (1), which was the result of a vehicle running the red light. The signal greatly enhanced the awareness of the intersection to approaching motorists.

Frontal impact collisions reduced from five (5) to three (3) after the signal was installed. Also, rear-end collisions reduced slightly in the after period from three (3) to two (2). No new crash patterns were formed due to the signal installation.

The calculated benefit to cost ratio for this project is 2.06 considering total crashes. The benefit to cost ratio considering only target crashes is 2.38. The benefits are calculated using the change in annual crash costs from the before to the after period. Operational and other benefits related to the project are not considered in this analysis. The costs of the project include the actual construction costs as well as the increase in annual maintenance and utility costs.

Please see the attached *Treatment Site Photos*. Photos are provided for all approaches to the treatment intersection. As the Safety Evaluation Group completes additional spot safety reviews for this type of countermeasure, we will be able to provide objective and definite information regarding actual crash reduction factors for this type of intersection.

Location Map
Catawba County, City of Hickory
Evaluation of Spot Safety Project # 12-98-009



Treatment Location: SR 1468 (Sweet Water Rd / 21st St. Dr. SE) at SR 1474 (27th St. Dr. SE)

TREATMENT SITE PHOTOS TAKEN 10/17/2007

Traveling Northeast on SR 1474 (27th Street Drive SE)

Traveling Northeast on SR 1474

Traveling Northwest on SR 1468 (21st Street Drive SE)

Traveling Northwest on SR 1468

Traveling Southeast on SR 1468 (21st Street Drive SE)

BENEFIT-COST ANALYSIS WORKSHEET

LOCATION: SR 1468 at SR 1474 BY: JBS
COUNTY: Catawba DATE: 10/31/2007
FILE NO.: SS 12-98-009 NOTES: Total Crashes

DETAILED COST: TYPE IMPROVEMENT - New Signal

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	$30,000	10	0.149	$4,471
	$0	0	0.000	$0
Right-of-Way	$0	0	0.000	$0
TOTALS	$30,000	10	0.149	$4,471

ESTIMATED INCREASE IN ANNUAL MAINT. COST = $2,000
ESTIMATED INCREASE IN ANNUAL UTILITY COST = $900

TOTAL ANNUAL COST= $7,371
TOTAL COST OF PROJECT= $30,000

COMPREHENSIVE COST REDUCTION:

ESTIMATED NUMBER OF ANNUAL ACCIDENT DECREASES

TIME PERIOD	YEARS	K & A CRASHES	K & A CRASHES PER YR	B & C CRASHES	B & C CRASHES PER YR	PDO CRASHES	PDO CRASHES PER YR	ANNUAL COSTS
BEFORE	4.42	0	0.00	6	1.36	11	2.49	$34,140
AFTER	4.42	0	0.00	4	0.90	3	0.68	$18,937

Annual Benefits from Crash Cost Savings $15,204

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = $7,833

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = 2.06

TOTAL COST OF PROJECT - $30,000 COMPREHENSIVE B/C RATIO - 2.06

BENEFIT-COST ANALYSIS WORKSHEET

LOCATION: SR 1468 at SR 1474 | BY: JBS
COUNTY: Catawba | DATE: 10/31/2007
FILE NO.: SS 12-98-009 | NOTES: Target Crashes

DETAILED COST: TYPE IMPROVEMENT - New Signal

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	$30,000	10	0.149	$4,471
	$0	0	0.000	$0
Right-of-Way	$0	0	0.000	$0
TOTALS	$30,000	10	0.149	$4,471

ESTIMATED INCREASE IN ANNUAL MAINT. COST = $2,000
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TOTAL ANNUAL COST= $7,371
TOTAL COST OF PROJECT= $30,000

COMPREHENSIVE COST REDUCTION:

ESTIMATED NUMBER OF ANNUAL ACCIDENT DECREASES

TIME PERIOD	YEARS	K & A CRASHES	K & A CRASHES PER YR	B & C CRASHES	B & C CRASHES PER YR	PDO CRASHES	PDO CRASHES PER YR	ANNUAL COSTS
BEFORE	4.42	0	0.00	5	1.13	8	1.81	$27,421
AFTER	4.42	0	0.00	2	0.45	2	0.45	$9,910

Annual Benefits from Crash Cost Savings $17,511

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = $10,140

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = 2.38

TOTAL COST OF PROJECT - $30,000 COMPREHENSIVE B/C RATIO - 2.38

Note: Crash 7 Ran-off Road
to avoid an Angle Collision

Note: Crashes 4, 5, and 11-17 all
failed to stop for the stop sign.

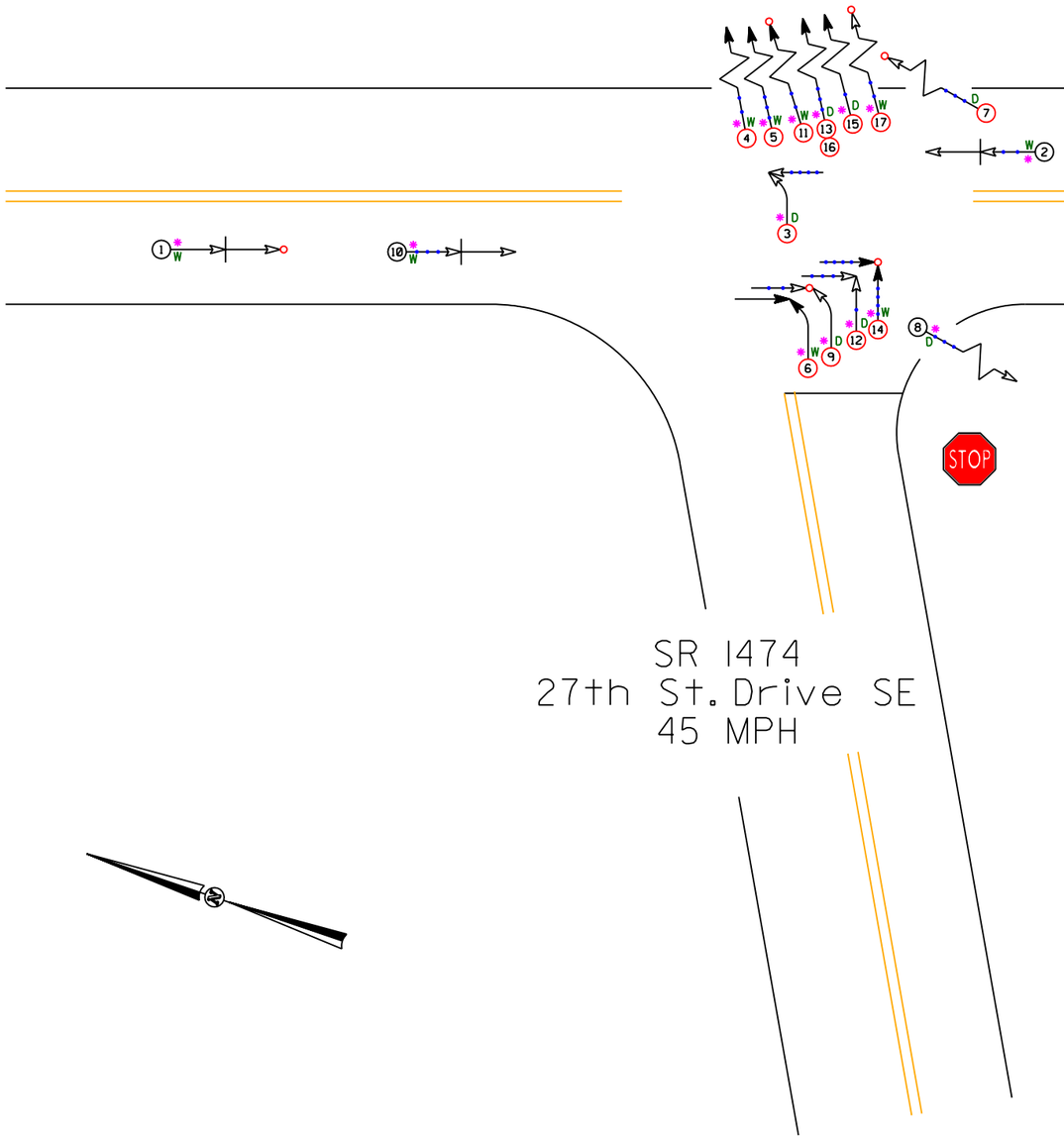
LEGEND

MOVING VEHICLE
PEDESTRIAN
PARKED VEHICLE
PARKING VEHICLE
FIXED OBJECT
HEAD ON
REAR END
RAN OFF ROAD

ANGLE
TURNING
BACKING
SIDESWIPE
OUT OF CONTROL
INJURY
FATALITY

9 MPH OR LESS
10 MPH TO 19
20 MPH TO 29
30 MPH TO 39
40 MPH TO 49
50 MPH TO 59
60 MPH TO 69
70 AND UP
SPEED UNKNOWN

P PEDESTRIAN
T TRAIN
* DRIVER AT FAULT
D DRY
W WET
I ICY OR SNOWY
O OILY



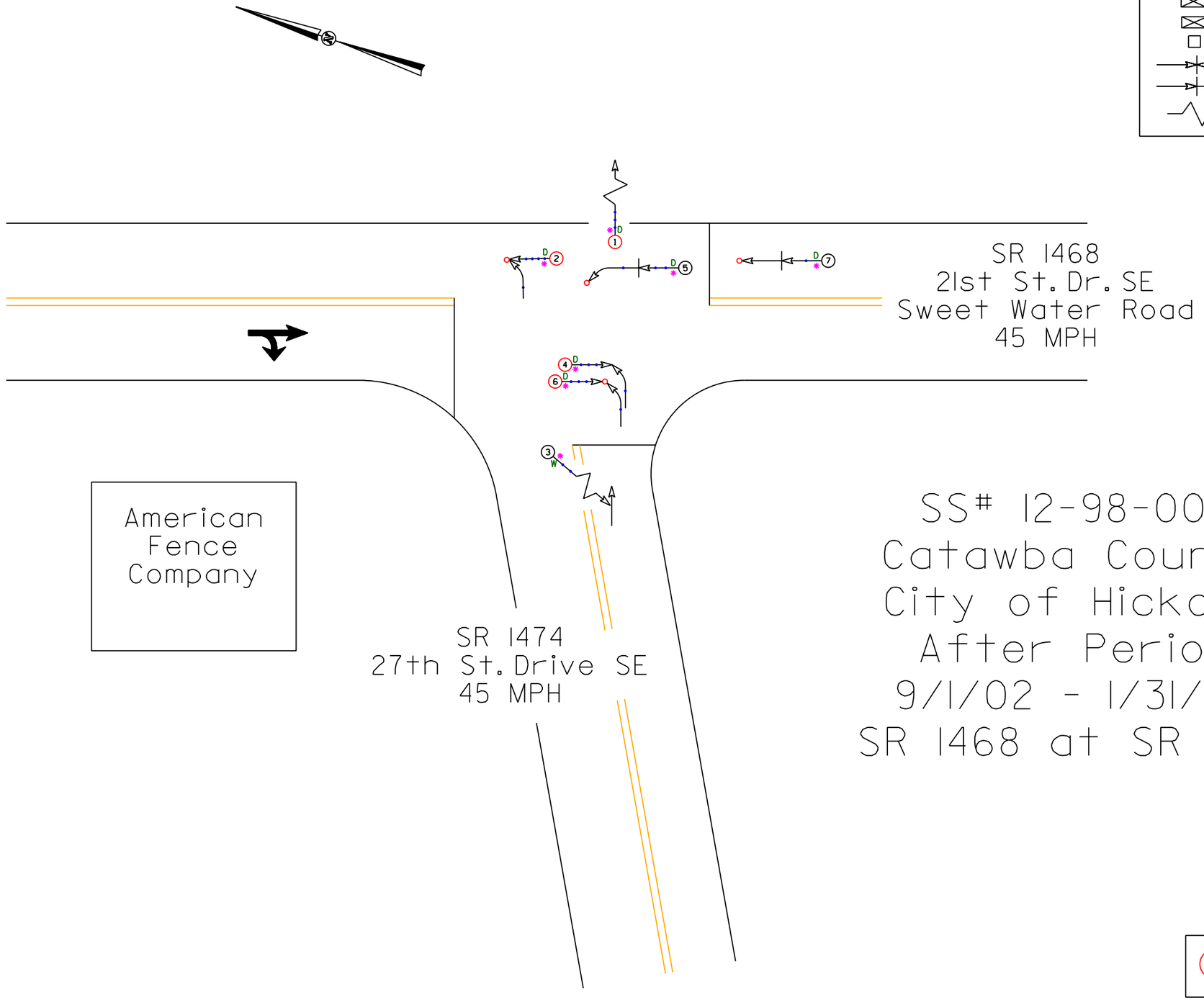
SS# 12-98-009
Catawba County
City of Hickory
Before Period
10/1/97 - 2/28/02
SR 1468 at SR 1474

Target Crashes

TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

COLLISION DIAGRAM	
DIVISION: 12	AREA:
STUDY PERIOD: 10/1/1997 TO 2/28/2002	
DISTANCE: Y-LINE = 150FT	
ANALYSIS PREPARED BY: JBS	
ANALYSIS CHECKED BY: BR	
DIAGRAM PREPARED BY: JBS	
DIAGRAM REVIEWED BY: ST	
SCALE: NOT TO SCALE	
DATE: 10-31-2007	
LOG NUMBER: SS# 12-98-009	

N.C. DEPARTMENT of TRANSPORTATION
DIVISION of HIGHWAYS
TRAFFIC ENGINEERING AND SAFETY SYSTEMS BRANCH



American Fence Company

LEGEND

MOVING VEHICLE
PEDESTRIAN
PARKED VEHICLE
PARKING VEHICLE
FIXED OBJECT
HEAD ON
REAR END
RAN OFF ROAD

ANGLE
TURNING
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70 AND UP
SPEED UNKNOWN

P PEDESTRIAN
T TRAIN
* DRIVER AT FAULT
D DRY
W WET
I ICY OR SNOWY
O OILY

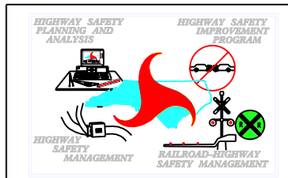
R
Y
G

New Signalized Intersection

SS# 12-98-009
Catawba County
City of Hickory
After Period
9/1/02 - 1/31/07
SR 1468 at SR 1474

(#) Target Crashes

TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT



COLLISION DIAGRAM	
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STUDY PERIOD: 9/1/2002 TO 1/31/2007	
DISTANCE: Y-LINE = 150FT	
ANALYSIS PREPARED BY: JBS	
ANALYSIS CHECKED BY: BR	
DIAGRAM PREPARED BY: JBS	
DIAGRAM REVIEWED BY: ST	
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